US-PAT-NO: 6611571

DOCUMENT-IDENTIFIER: US 6611571 B1

TITLE: Apparatus and method for demodulating an angle-modulated
       signal

Abstract Text - ABTX (1):
   An angle demodulator in which an FM modulated wave is converted into an IF
signal (SI) in the form of digital so as the signal is supplied to a Hilbert
transformer (81) and to an outer product calculation section (82). The Hilbert
transformer (81) allows the phase of the IF signal (SI) to shift ninety degrees
and supplied it to the outer product calculation section (82). An integrator
(84) calculates a phase of a cosine wave of an angular frequency that a
frequency control unit (83) designates. A phase converter (85) calculates the
cosine wave and an instantaneous value of a signal in which the cosine wave
shifts ninety degrees out of phase so as to supply the value to the outer
product calculation section (82). The outer product calculation section (82)
supplies to the frequency control unit (83) an outer product of a vector
including a value of the IF signal and of a signal from the Hilbert transformer
(81) and a vector including a value supplied from the phase converter (85).
The frequency control unit (83) performs a proportion integral control to the
outer product so as to determine an updated value of an angular frequency, and
supplies the determined value to the integrator (84). A digital signal
representing the value of the angular frequency is converted into an analog
signal as a result of D/A conversion and is reproduced as a voice.

Brief Summary Text - BSTX (6):
   A conventional angle demodulator, with digital signal processing, is
composed of an FM demodulator in which an FM signal is demodulated by applying
the FM signal and a signal whose phase has shifted ninety degrees with respect
to that of the FM signal.

Brief Summary Text - BSTX (7):
   The FM demodulator demodulates the FM signal based on equation (1) where X
represents the FM signal to be demodulated and Y represents a signal whose
phase advances ninety degrees with respect to the FM signal, and F represents a
result of the FM signal being demodulated.

Brief Summary Text - BSTX (8):
   As illustrated in FIG. 5, the FM demodulator comprises, for example, an A/D
converter 101, a delay compensator 102, a ninety-degree phase shifter 103, a
phase angle calculator 104, a differentiator 105 and a D/A converter 106.
Brief Summary Text - BSTX (9):
   In this type of FM demodulator, the FM signal X is input to the A/D
converter 101 so as to be converted into a digital signal. This digital signal
is input both to the delay compensator 102 and to the ninety-degree phase
shifter 103.